

# A New Species of *Trichogorgia* and Records of Two Other Octocorals New to the Palau Islands<sup>1</sup>

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## Abstract

Three species of octocorals are reported for the first time from the Palau Islands, two alcyonaceans and one gorgonacean, which are described and illustrated. The latter is *Trichogorgia faulkneri* n. sp., a shallow-water member of the holaxonian family Chrysogorgiidae, the first record of the genus for the tropical Pacific.

## INTRODUCTION

In the course of making underwater photographs of various reef organisms in the Palau Islands during the summer of 1973, Mr. Douglas Faulkner observed, photographed, and collected a number of very interesting octocorals. As many of these were taken by diving from depths rarely collected heretofore, they present some difficult taxonomic problems and at this time it is impossible even to list the species obtained. However, a few of the species that were not reported from Palau by Utinomi (1956) are so outstanding that they merit immediate record. Especially noteworthy are three species, two alcyonaceans and one gorgonacean, which are reported here.

## ACKNOWLEDGMENTS

All of the specimens from the Palau Islands, upon which this paper is based, were collected by Mr. Douglas Faulkner, who for several years has been indefatigable in collecting, preserving, and photographing the scleractinians and octocorals of the Palaus. I am grateful to him for obtaining such interesting and valuable data, and for his kind permission to publish photographs given in plates 1 and 3. Mr. Stephen D. Cairns most helpfully made the photographs of *Bellonella indica* shown on plate 2, and I am glad to extend my thanks to him. The Japanese summary was very kindly translated by Dr. Won Tack Yang, to whom I express my appreciation.

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## DESCRIPTIONS

## Order ALCYONACEA

Family NIDALIIDAE J. E. Gray, 1869

Subfamily NIDALIINAE J. E. Gray, 1869

Genus *Nidalia* J. E. Gray, 1835

*Nidalia* Gray, 1835:60 (type-species, *Nidalia occidentalis* Gray, 1835, by monotypy).—Utinomi, 1958:101.

*Cactogorgia* Simpson, 1907:829 (type-species, *Cactogorgia celosioides* Simpson, 1907, by original designation according to Art. 68(a) (i), International Code of Zoological Nomenclature).—Utinomi, 1958:114.

Prof. H. Utinomi already has pointed out that Simpson's genus *Cactogorgia*, originally described for three species from the Indian Ocean (Simpson, 1907), is not separable from Gray's genus *Nidalia*, based on *Nidalia occidentalis* from Montserrat in the West Indies. All of basically torch-like growth form, the three original *Cactogorgia* species differ among themselves in the shape of the capitulum and arrangement of zooids on it, the number of chevrons of spicules in the opercular points, and the number of transverse rows in the crown. Three other species later added to *Cactogorgia* differ in the same characters. One of these, *Cactogorgia simpsoni* Thomson and Dean, 1931, was considered by Prof. Utinomi to be identical with the Atlantic *Nidalia occidentalis* Gray (Utinomi, 1958:105–106). Although the two species are similar in many ways, direct comparison of abundant Atlantic material with grossly similar specimens from the Palau Islands reveals differences that easily can be considered of systematic importance. Such differences include the size of the zooids, the number and arrangement of spicules in the opercular points, extent of the crown, and the size and proportions of the spicules (including the minute scales of the introvert). Therefore, I think it is too early to synonymize them formally.

***Nidalia lampas* (Thomson and Mackinnon, 1910) ?**

(Fig. 1, A–F; Plate 2, E)

? *Cactogorgia lampas* Thomson and Mackinnon, 1910: 196, pl. 11, fig. 6; pl. 13, fig. 16 (Seychelles, 37 fms.).

? *Cactogorgia simpsoni* Thomson and Dean, 1931:184, pl. 15, figs. 6, 8; pl. 27, fig. 3 (Siboga Sta. 289, 9° 0.3' S, 126° 24.5' E, 112 m).

*Cactogorgia lampas*.—Thomson and Dean, 1931:183, pl. 3, figs. 3, 5; pl. 6, fig. 10 (Siboga stas. 164, 1° 42.5' S, 130° 47.5' E, 32 m; 260, 5° 36.5' S, 132° 55.2' E, 90 m).

MATERIAL EXAMINED: Great Reef, Baileschesengel Island, Ngemelis Islands, Palau, 12 m, coll. Douglas Faulkner, August 9, 1973; 2 specimens.

DESCRIPTION: The specimens before me have the distinctive torch-like growth-form characteristic of *Nidalia occidentalis*, *Cactogorgia lampas* and *Cactogorgia simpsoni*. Preserved, they are burnt umber in color, but photographs made *in situ*

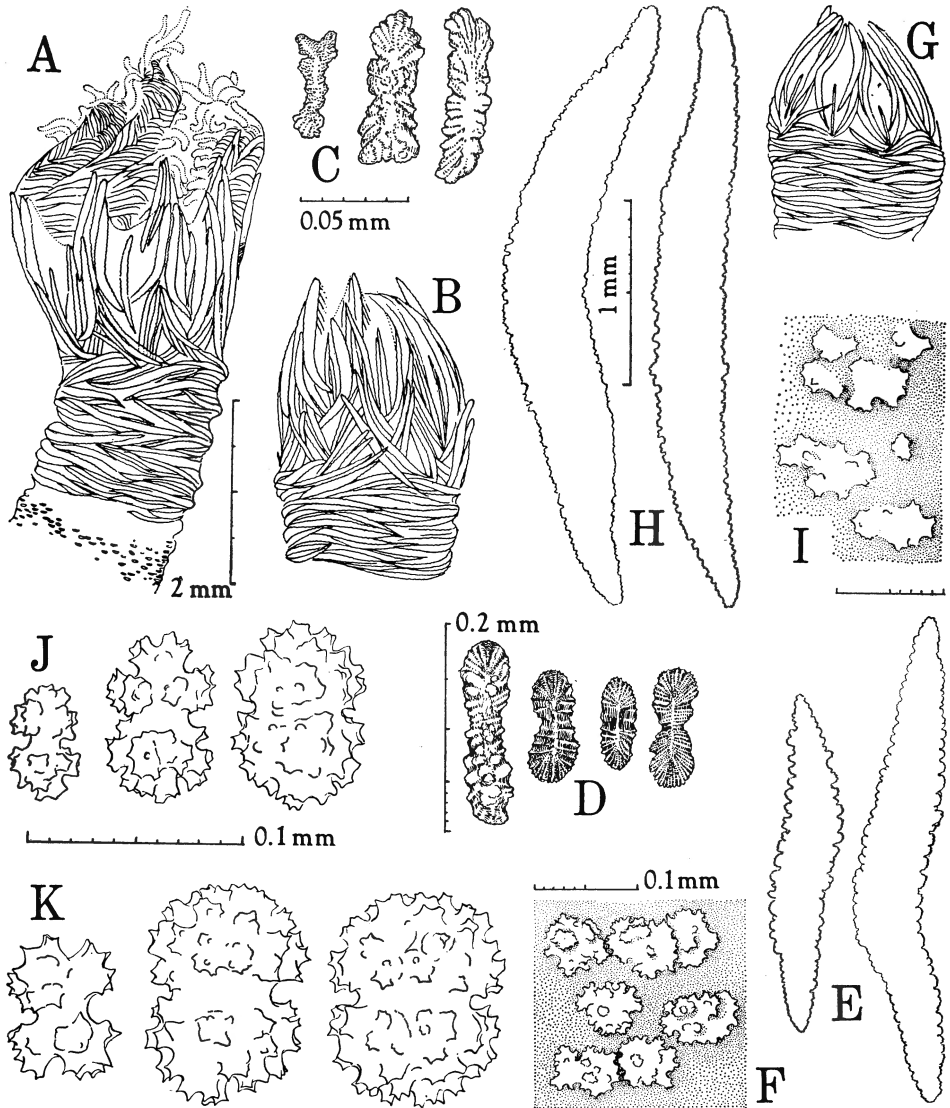


Fig. 1. A-F, *Nidalia lampas* (Thomson and Mackinnon)?, from Palau Islands: A, anthocodia preserved with tentacles partly extended; B, another anthocodia, tentacles infolded, drawn to same scale; C, spicules from pinnules; D, spicules from introvert; E, outline of spicules from stalk, drawn to scale of H; F, detail of sculpture of stalk spicules, drawn to scale of F. . . G-I, *Nidalia occidentalis* Gray, from Mona Passage, Greater Antilles: G, anthocodia with tentacles infolded, drawn to scale of A and B; H, outline of spicules from stalk; I, detail of sculpture of stalk spicules, drawn to scale of F. . . J-K, *Bellonella indica* Thomson and Henderson, from Palau Islands: J, spicules from outermost coenenchyme; K, spicules from interior of stalk, drawn to scale of J.

on the reef show that the living animals are reddish orange. The irregularly hemispherical capitulum bears numerous prominent, tapering calyces into which the anthocodiae are retracted in various degrees. The capitulum is covered with a rather thick layer of tissue which obscures the large spicules that give it rigidity. The stalk is very rigid, deeply grooved, and more or less crooked.

The zooids that are preserved exsert show that the armature consists of a wide crown composed of 10–15 transverse rows of curved spindles, surmounted by eight strong points, each containing several pairs of curved or bent spindles set *en chevron* (Fig. 1, A, B); in many of the zooids, two or three pairs in each point are larger and more strongly bent than the others, but in some they are more nearly uniform in size and merely converge distad, so the *en chevron* arrangement is not so distinct. The proximal spicules of the points gradually assume a more transverse arrangement toward the crown, with the upper rows of which they gradually merge. The backs of the tentacles are armed with two rows of obliquely placed, curved and flattened spindles, and the pinnules are densely packed with flattened rodlets (Fig. 1, C) transversely set and curved to fit the contour of the pinnules. The introvert contains numerous small, opaque white rods, flat, oval in outline and commonly with a median constriction (Fig. 1, D).

The spicules of the capitulum and stalk are stout, tuberculated spindles (Fig. 1, E) up to approximately 2.5 mm in length and from 4.5 to 6.5 times as long as wide. They lie longitudinally in the walls of the calyces, longitudinally in the distal part of the stalk and irregularly in the proximal part.

In one of the specimens, the capitulum is roughly 18×25 mm in diameter and the stalk is about 3 cm tall and 5×7 mm in diameter in the proximal part (Plate 2, E), whereas in the other, the capitulum is about 13×19 mm in diameter but the stalk is 7 cm tall and about 5 mm in diameter in its proximal part.

The overall color is brown; except for the small spicules of the introvert and pinnules, the spicules are of a dull orange or reddish orange color.

DISCUSSION: These specimens have many features in common with both *Cactogorgia simpsoni* and *C. lampas* as described by Thomson and Dean (1931:183, 184). As Thomson and Dean's figures of the anthocodial armature show the large spindles of the opercular points to be straight in *C. simpsoni* and curved in *C. lampas*, the present specimens agree better with the latter. Moreover, Thomson and Dean observed up to 10 horizontal rows in the crown of their specimens of *C. lampas*, which, in view of the difficulty in distinguishing and counting these rows, is in reasonably good agreement with the Palauan specimens but not with the original material of *C. lampas*, which had only about six rows (Thomson and Mackinnon, 1910:196). Although the judgment is strongly subjective at this point, I believe the Palauan material is in better general agreement with Thomson and Dean's *C. lampas* than with *C. simpsoni*. I cannot be sure that Thomson and Dean's *C. lampas* is the same as the original *C. lampas* of Thomson and Mackinnon, but they are similar in many ways. As I have not seen the type-specimen of *C. lampas* nor Siboga specimens assigned to that species, I am assigning the Palauan specimens to *Nidalia lampas*

with a question mark.

For the sake of comparison, I illustrate on Plate 2, D, a specimen of the West Indian *Nidalia occidentalis* Gray, the type-species of the genus, photographed at the same scale as the specimen of *N. lampas* ? in the adjacent figure. Although the color of *N. occidentalis* varies from dull orange to pure white, and the anthocodial spicules may be yellowish in some colonies and colorless in others, none of the Atlantic specimens I have seen has the dark brown color of the preserved Palauan specimens. In West Indian *N. occidentalis*, the capitulum has a rough appearance because of the large spicules lying exposed at the surface, but in the Palauan specimens the spicules are covered by an opaque layer of tissue that obscures them from view and gives the capitulum a fleshy appearance.

The anthocodiae of *N. occidentalis* have a very wide transverse crown of fifteen or more rows of curved spindles (Fig. 1, G), but the points have fewer pairs of spicules and are more sharply differentiated from the crown than in *N. lampas* ? from Palau. The spicules of the stalk (Fig. 1, H) reach a larger size, 3 mm or longer, and are less elaborately sculptured.

Although a thorough study and detailed redescription of the various *Nidalia* species will be necessary to clarify their status, I think it is clear that the Pacific species such as *N. lampas* and *N. simpsoni* must be considered distinct from the Atlantic *N. occidentalis*.

Family ALCYONIIDAE Lamouroux, 1812

Genus *Bellonella* J. E. Gray, 1862

*Bellonella* Gray, 1862:35 (type-species, *Bellonella granulata* Gray, 1862, by monotypy).

The history of this genus and its involvement with *Nidalia* Gray have been discussed in detail by Utinomi (1958).

*Bellonella indica* Thomson and Henderson, 1905

(Fig. 1, J, K; Plate 1; Plate 2, A-C)

*Bellonella indica* Thomson and Henderson, 1905:274, pl. 6, fig. 5 (deep water south of Galle).

Not *Alcyonium* (*Erythropodium*) *indicum*.—Thomson and Mackinnon, 1910:174, pl. 12, fig. 7.

MATERIAL EXAMINED: Great Reef, Baileschesengel Island, Ngemelis Islands, Palau, 5 m, coll. Douglas Faulkner, August 6, 1973; 3 specimens, zooids preserved extended.—Same location, August 28, 1973; 13 specimens, zooids contracted.

DESCRIPTION: The colonies are digitate or columnar (Plate 1; Plate 2, A-C), gently tapering to a blunt tip, 40–70 mm tall, greatest diameter at base about 20 mm; zooids present on most of surface, the sterile stalk being short and inconspicuous, in some colonies not evident at all. Zooids fully retractile, not forming projecting anthosteles. In complete retraction, the surface of the colony may be thrown into

irregular transverse folds (Plate 2, B). Branching of the capitulum is infrequent, occurring in only one of the 16 specimens examined (Plate 2, A). Two others show an inconspicuous lateral lobe.

The expanded zooids are about 5 mm tall when preserved, but photographs of living colonies made *in situ* by the collector show them to be much taller (Plate 1). A crude calculation made from a photograph indicates a height of at least 17 mm, probably as much as 20 mm because some individuals equal or exceed the diameter of the capitulum.

I have found no spicules in the anthocodiae.

The outermost layer of coenenchyme contains capstans, which become short-waisted double heads when fully developed (Fig. 1, J); their average size is 0.061 mm, based on 26 measurements, and the standard deviation is 0.013. The interior of the colony contains larger double heads with a short waist (Fig. 1, K), averaging 0.099 mm in length, with a standard deviation of 0.019, based on 25 measurements; these spicules seem to be derived mostly from 6-radiates.

Of 16 colonies, 13 are brick red, one is orange, and two are yellow. Mr. Faulkner's color photographs show that some specimens are almost white.

REMARKS: In *Bellonella*, the anthocodial armature when present is arranged in eight points of converging spindles over a rather narrow transverse crown and is very conspicuous. As the original authors of *B. indica* found only a few spicules in the polyps and thought that these might have been artificial inclusions (Thomson and Henderson, 1905:274), it seems probable that the zooids are unarmed. Although Thomson and Henderson did not illustrate the spicules of *B. indica*, the description and measurements are in good agreement with those of the present material.

It seems likely that the specimens reported as *Alcyonium (Erythropodium) indicum* (Thomson and Henderson) by Thomson and Mackinnon (1910:174) represent a different species, as the zooids "have numerous spicules diffusely disposed on their protrusible portion." Unfortunately, the spicules were not figured, but the coenenchymal bodies were described as "warty, double spheres" and "Sechser." Measurements were not given.

Both *Bellonella grayi* (Thomson and Dean, 1931:37) and *B. albiflora* Utinomi (1957:159) were described as lacking spicules in the anthocodiae, but both differ from the present material in the form of their spicules.

#### Order GORGONACEA

#### Suborder HOLAXONIA

#### Family CHRYSOGORGIIDAE

Members of this gorgonacean family characteristically are inhabitants of deep water, occurring as deep as 3375 m (Wright and Studer, 1889:21). The greatest number of species (27) is reported from depths between 500 and 1000 m; 20 species have been reported between 100 and 500 m, 20 between 1000 and 2000 m, and 4 from deeper than 2000 m. Only one species of *Chrysogorgia* and one of *Trichogorgia* have

been reported from depths shallower than 100 m.

It therefore was surprising to find among the gorgonians collected in the Palau Islands by Mr. Faulkner some specimens from only 14 m that clearly belong to the family Chrysogorgiidae on the basis of axial structure, form of polyps, and shape and structure of spicules. They do not have the multiplanar branching of *Chrysogorgia*, but immediately recall to mind the western Atlantic species *Trichogorgia viola* Deichmann, 1936, and the South African *Trichogorgia flexilis* Hickson, 1904. Both of those species have a delicate growth form, branched in one plane, and small but typical chrysogorgiid spicules.

Nutting (1910:32) described a new genus and species, *Plumigorgia hydroides*, which he included in the family Gorgonellidae (now called Ellisellidae). In 1955, I pointed out that *Plumigorgia* could not be included in the Ellisellidae (Bayer, 1955:214), and at the same time described a new species, *Plumigorgia wellsii*, from Arno Atoll. I called attention to similarities of these two forms to a peculiar, bushy gorgonian from the seaward slope of Ifaluk Atoll, to which I gave the name *Ifalukella yanii*, and proposed for all three a new family Ifalukellidae. In all three, the axis is calcified but is similar in structure to that of the Primnoidae and Chrysogorgiidae and unlike that of the Ellisellidae. The spicules are minute, finely granulated disks, double disks, or flat rods with or without median constriction, not especially chrysogorgiid in appearance.

The pinnate gorgonian from Palau, with its distinctly chrysogorgiid characters, provides a connecting link and suggests that *Plumigorgia* and *Ifalukella* also may be related to the Chrysogorgiidae. For the time being, however, it is preferable to maintain the familial allocations as they are, pending a detailed investigation of all the species involved.

#### ***Trichogorgia faulkneri*, n. sp.**

(Fig. 2; Fig. 3, A-C; Plate 3)

**MATERIAL EXAMINED:** Mutremdiu Point, Uchelbeluu Island, Palau Islands, 14 m, coll. Douglas Faulkner, July 24, 1973; 9 specimens.

**DIAGNOSIS:** Flabellate chrysogorgiid pinnately and alternately branched in one plane, undivided terminal branchlets very slender, 0.1 mm in diameter, up to 35 mm long but mostly 15-20 mm; zooids small, widely spaced, set in a loose spiral around the branchlets and biserially on the main branches and trunk. Spicules sparsely distributed, mostly confined to the zooids, in irregular chevrons below the tentacles, longitudinal in proximal part of tentacles, oblique or transverse in distal part; absent or extremely rare in coenenchyme between zooids. Spicules in the form of thin, elongated scales with blunt ends and weak median constriction, surface finely granular, edges minutely serrated; those of zooid body up to 0.12 mm long, 0.015 mm wide, those of tentacles 0.03 mm long, with irregularly serrated ridges.

**HOLOTYPE:** National Museum of Natural History, Smithsonian Institution.

**DESCRIPTION:** The colonies are flabellate and branched in one plane, alternately

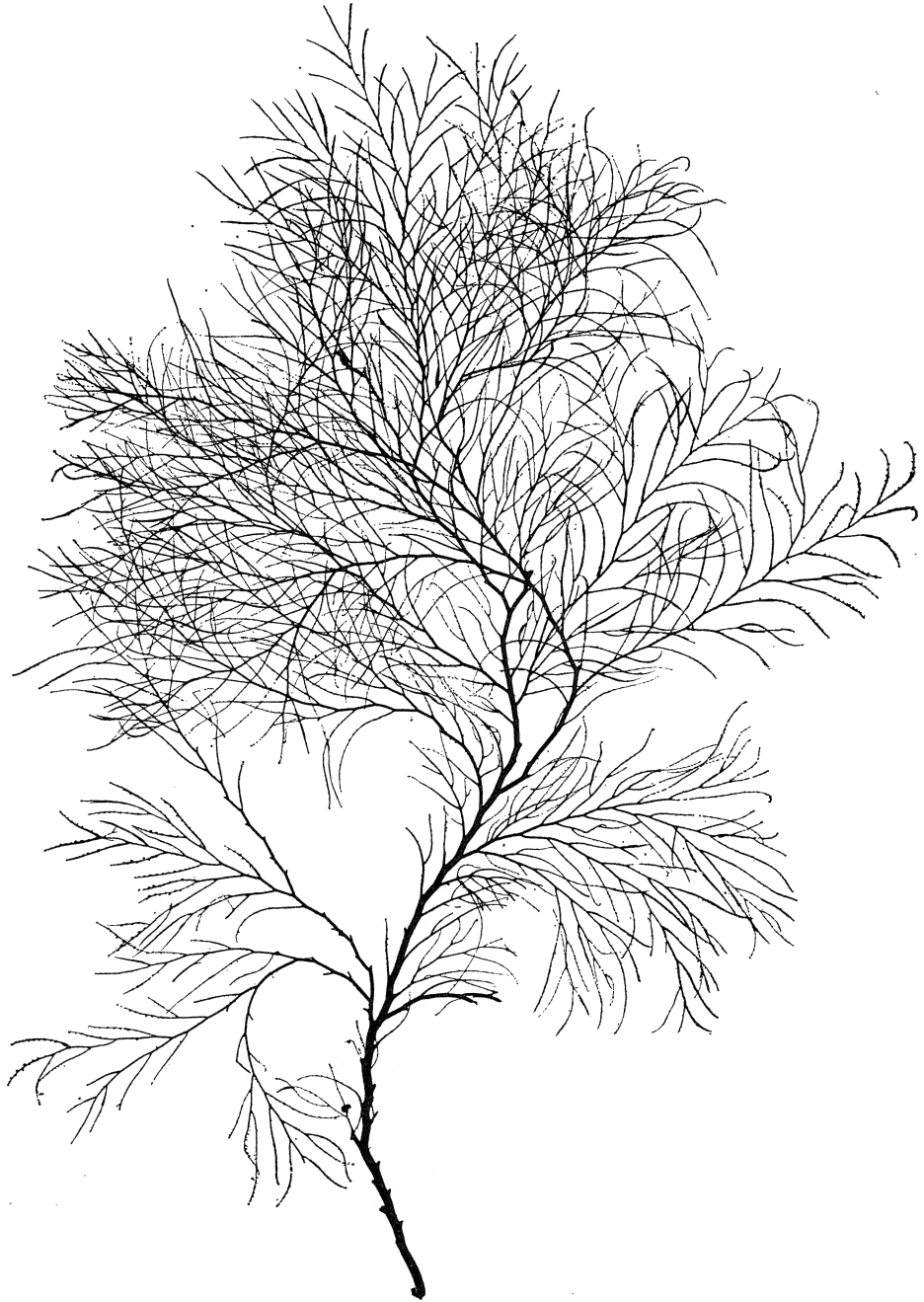


Fig. 2. *Trichogorgia faulkneri*, n. sp. Branching pattern of fully developed colony from Palau Islands.



pinnate, without anastomosis (Fig. 2). The holotype is a colony 280 mm in height, lacking the basal attachment, and 200 mm wide; its main stem is somewhat flattened at right angles to the plane of branching and is  $2.5 \times 1.1$  mm in diameter. The axis

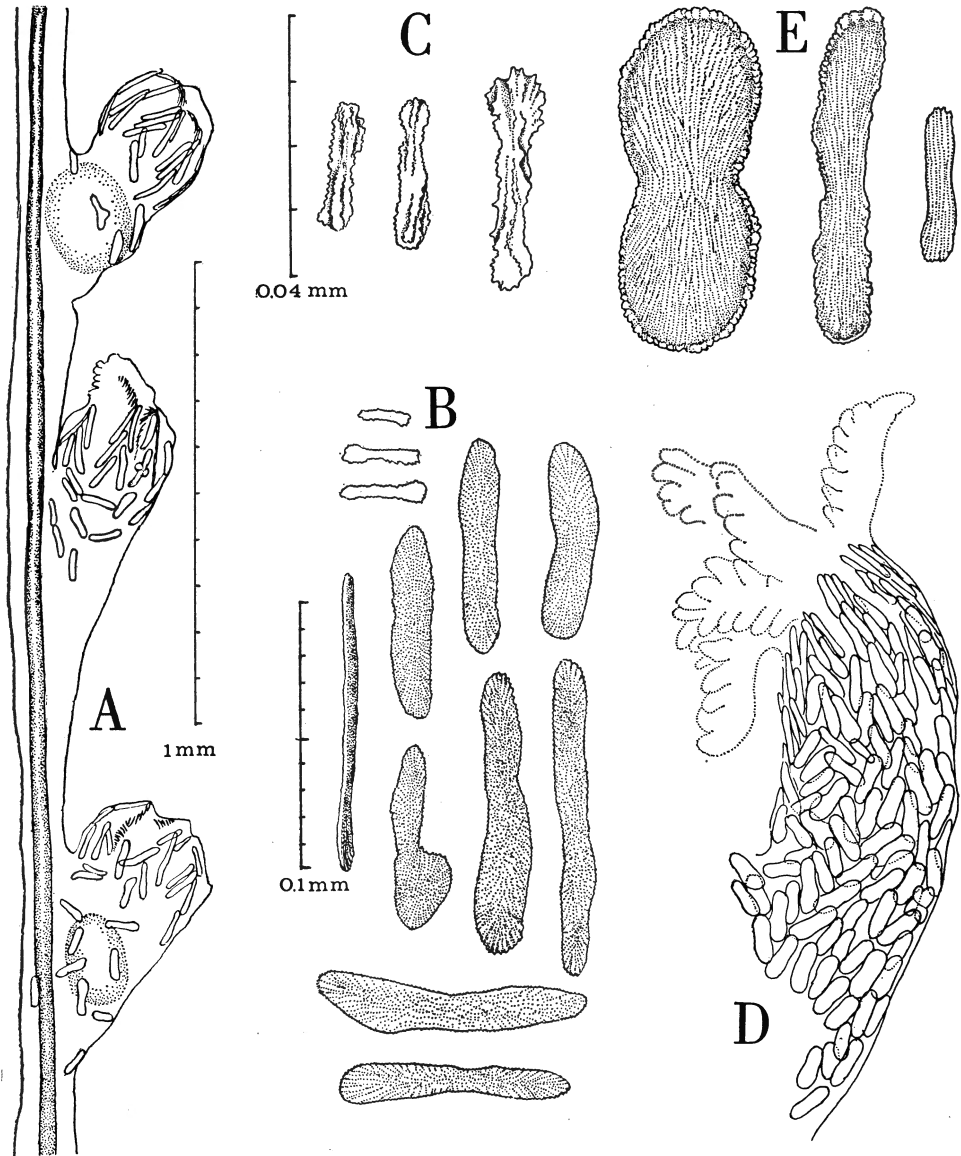


Fig. 3. A-C, *Trichogorgia faulkneri*, n. sp., from Palau Islands: A, three zooids on terminal branchlet; B, spicules from zooids; C, spicules from tentacles at greater magnification.—D-E, *Trichogorgia flexilis* Hickson, from south of Port Elizabeth, South Africa: D, single zooid drawn at same scale as A; E, spicules from zooids, drawn at same scale as B.

is strongly calcified, olivaceous brown and longitudinally grooved in the main stem, becoming paler in the secondary branches and creamy white in the ultimate branchlets; it shows metallic golden reflections most conspicuously in the larger parts and most noticeably when the animal is alive *in situ* (Plate 3); at the distal ends of the terminal branchlets the axis becomes very thin, 0.03 mm in diameter or somewhat less. The undivided branchlets arise in a regularly alternate pinnate manner, from less than 4 mm to more than 12 mm apart measured along one side of the main axis; the average interval is about 8.5 mm. Examination of the axis by transmitted polarized light shows that the branching is essentially monopodial, with the branchlets for the most part remaining branchlets. The gross appearance of the axis suggests, however, that lateral branchlets occasionally assume dominance and become the main axis, but I have been unable to determine how commonly this occurs.

Branching proceeds at least to the fourth order, which seems to be the rank of most of the undivided terminal branchlets. These are at most about 35 mm in length, but most are shorter, commonly 20–25 mm. The average of 30 measurements, excluding obviously undeveloped branchlets near the ends of larger branches, is 20.5 mm.

The zooids (Fig. 3, A) are small, about 0.4 mm tall in the contracted condition, in which the tentacles are folded inward over the oral disk; they occur on the trunk and main branches as well as on the terminal branchlets. On the trunk and large branches, zooids are present along the two sides from which the branchlets arise but are not present on the front and back of the colony; they may have been rubbed off during collection and preservation but, if so, no trace of them remains. On the terminal branchlets they are directed distad, set at approximately a 45° angle with the axis, from 0.5 to 1.5 mm apart and arranged in a very lax spiral.

Spicules are present only in the zooids, where a few elongated, thin, minutely granulated, flat scales up to 0.12 mm long and 0.015 mm wide are placed in irregular chevrons beneath each tentacle (Fig. 3, B). In the proximal part of the tentacles, the spicules assume a longitudinal orientation, but toward the tips they become oblique or transverse. The contracted state of the zooids has not allowed me to see where this transition occurs. The spicules of the tentacles decrease in size distad, where they become irregularly rodlike with several serrated ridges (Fig. 3, C); the larger ones are 0.03 mm long, the smaller ones 0.02 mm or even less.

The coenenchyme is extremely thin, and spicules were seen in it extremely rarely.

Eight additional specimens complete the type series. One of them is 350 mm tall, two are 290 mm, and one is 190 mm, all preserved dry. Of four smaller colonies about 150 mm tall, one was preserved in 70% ethanol immediately upon collection, one in buffered 10% formalin, and two in sea-water Bouin's fixative.

Samples from two of the specimens were sectioned and found to be males. Zooxanthellae were not found.

COMPARISONS: I illustrate a zooid and spicules of *Trichogorgia flexilis* Hickson, the type-species of the genus, on Fig. 3, D, E. The zooids are larger, more closely placed, and contain numerous spicules of larger size and different

shape from those of *Trichogorgia faulkneri*. The terminal branches are relatively longer, and the coenenchyme contains abundant spicules.

## 要 約

パラオ群島産八放サンゴの三種を新らしく報告記載した。一種は海トサカ目の *Cactogorgia* 属に属する種で、西印度諸島産の標本に基づいて内海教授がすでに旧属名 *Nidalia* の異名として報告しているものである。このパラオ産の種は外見上 *Siboga Expedition* 報告書に Thomson and Dean (1931) が記載した *Cactogorgia simpsoni* と *C. lampas* とも大変類似している。これらパラオ産標本は一般的外観、色彩、ポリプの形質上、より *C. lampas* に近似しているが、冠部の骨片が多数発達している点においては *C. simpsoni* により近似している。著者は試みにこの標本を *C. lampas* として同定し、これを *Nidalia lampas* と称した。また同じく試みに *C. simpsoni* を *C. lampas* と同種異名とした。著者は *C. simpsoni* が大西洋産の *Nidalia occidentalis* と同種異名であるとの内海教授の見解に同意出来ない事は残念である。直接比較したる処数多の異形質を示している。

次の種は *Bellonella* 属に属するものである。この属は内海教授が 1958 年に訂正したる如く、長い間多くの研究家が誤って *Nidalia* の異名としていた。この標本は *Bellonella indica* Thomson and Dean に最も一致しているが、種の確定はタイプ標本と比較検証が必要である。

第三種はヤギ目の *Chrysogorgiidae* (科) の *Trichogorgia* 属に属するもので熱帯太平洋海域にて初めて記録されるものである。群体は繊細な扇状で一平面上に分枝し、その骨軸は美しい金彩色を呈す。これは新種で著者は採集者に敬意を表して *Trichogorgia faulkneri* と命名した。

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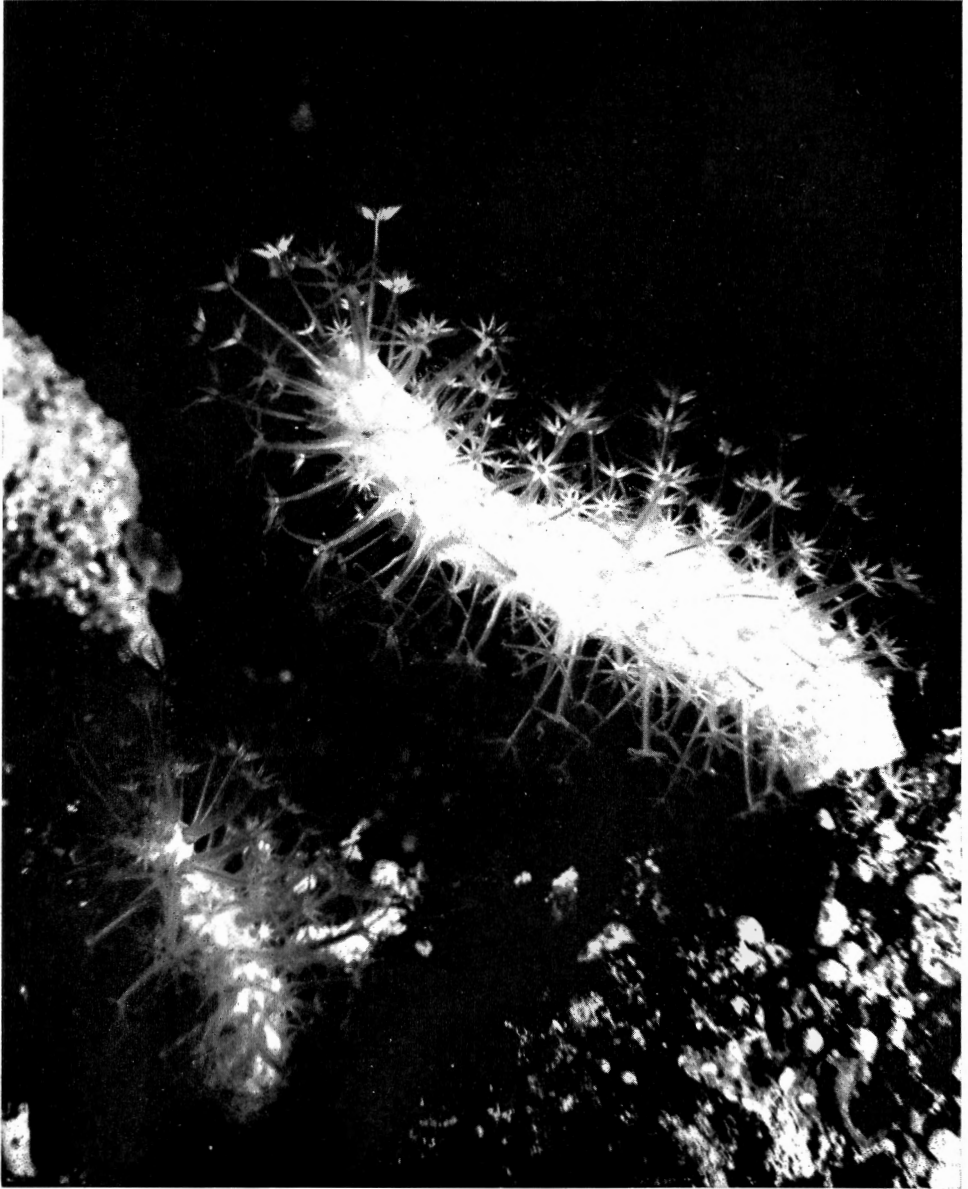
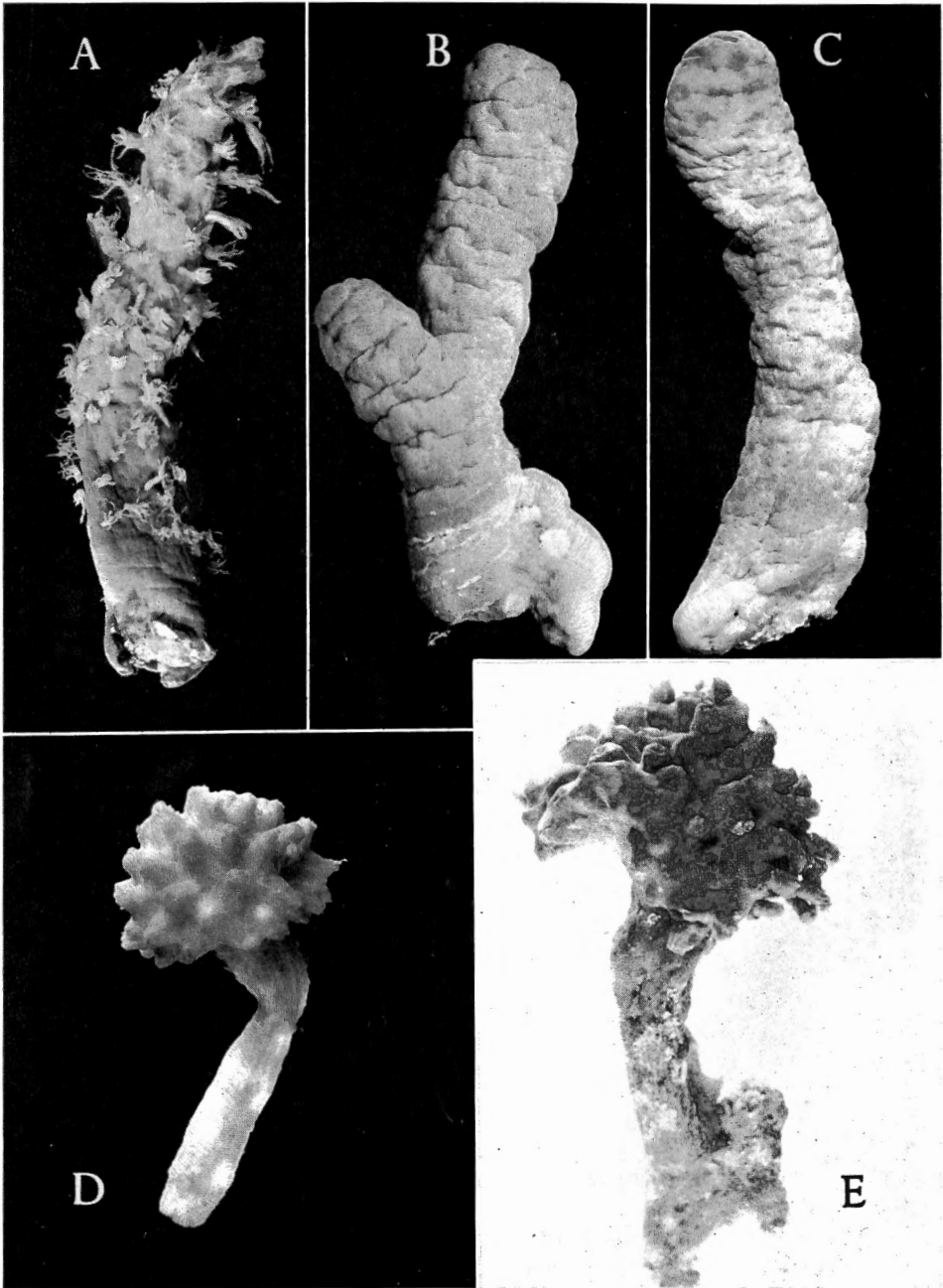


PLATE 1

*Bellonella indica* Thomson and Henderson, photographed alive underwater in the Palau Islands by Douglas Faulkner. Photograph © Douglas Faulkner.



## PALTE 2

- A. *Bellonella indica* Thomson and Henderson. Preserved specimen 70 mm tall.  
 B. *Bellonella indica* Thomson and Henderson. Preserved specimen with branched capitulum; 55 mm tall.  
 C. *Bellonella indica* Thomson and Henderson. Preserved specimen 68 mm tall.  
 D. *Nidalia occidentalis* Gray. Preserved specimen 40 mm tall.  
 E. *Nidalia lampas* (Thomson and Mackinnon)?. Preserved specimen 55 mm tall.

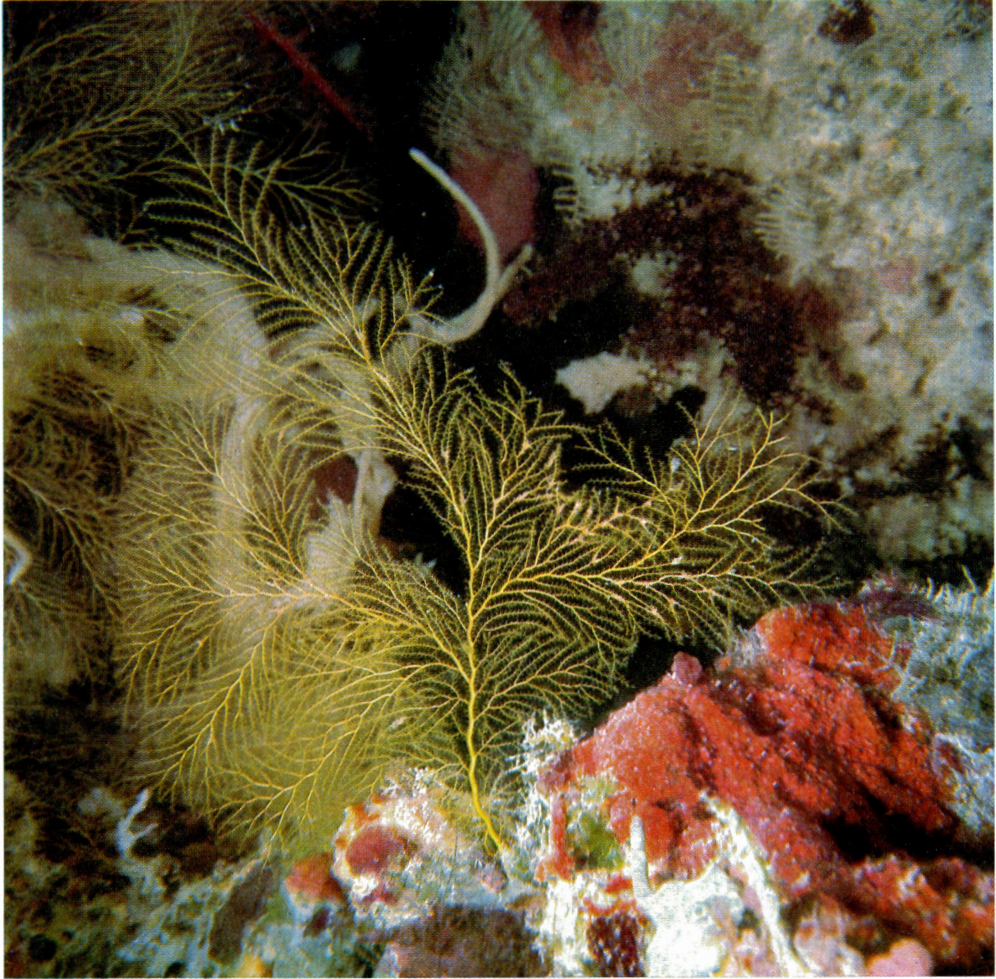


PLATE 3

*Trichogorgia faulkneri* n. sp., photographed alive underwater in the Palau Islands by Douglas Faulkner. Photograph © Douglas Faulkner.